

ABSTRAK

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Judul : Distribusi Gen MTHFR C677T dan A1298C pada Perempuan dengan Fertilisasi in Vitro (IVF)

Kegagalan kehamilan pasca *in vitro fertilization* (IVF) merupakan kondisi multifaktorial yang dipengaruhi oleh faktor genetik, metabolik, dan klinis. Salah satu faktor genetik yang banyak dikaji adalah polimorfisme gen *Methylenetetrahydrofolate Reductase* (MTHFR), khususnya varian C677T dan A1298C, yang berperan dalam metabolisme folat dan regulasi kadar homosistein. Gangguan pada jalur ini dapat memengaruhi ketersediaan asam folat aktif yang penting dalam proses reproduksi. Penelitian ini bertujuan menganalisis distribusi serta implikasi polimorfisme gen MTHFR C677T dan A1298C, baik secara individual maupun kombinasi haplotype, terhadap kejadian kegagalan kehamilan pasca IVF pada perempuan pasangan infertil. Penelitian ini menggunakan desain observasional analitik dengan pendekatan kasus–kontrol. Subjek penelitian adalah perempuan pasangan infertil yang menjalani program IVF dan dikelompokkan menjadi kelompok kegagalan kehamilan pasca IVF dan kelompok kehamilan klinis. Sampel biologis diperoleh melalui *buccal swab* atau *buccal gargle*, diikuti ekstraksi DNA metode GENxTRACT. Analisis polimorfisme gen MTHFR dilakukan menggunakan teknik *quantitative Polymerase Chain Reaction* (qPCR) berbasis sistem multiplex. Hasil menunjukkan tidak terdapat perbedaan distribusi genotipe MTHFR C677T dan A1298C secara individual ($p > 0,05$). Namun, analisis haplotype kombinasi kedua varian menunjukkan asosiasi bermakna dengan kegagalan kehamilan pasca IVF ($p < 0,05$). Temuan ini menegaskan pentingnya pendekatan haplotype dalam interpretasi risiko genetik serta implikasinya terhadap optimalisasi status asam folat dan konseling genetik pada program IVF.

Kata kunci: MTHFR C677T, MTHFR A1298C, fertilisasi in vitro, polimorfisme genetik, kegagalan kehamilan, haplotype, konseling genetik.

ABSTRACT

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in Women Undergoing In Vitro Fertilization (IVF)

Pregnancy failure following in vitro fertilization (IVF) is a multifactorial condition influenced by genetic, metabolic, and clinical factors. One of the most extensively studied genetic factors is polymorphism of the Methylenetetrahydrofolate Reductase (MTHFR) gene, particularly the C677T and A1298C variants, which play key roles in folate metabolism and homocysteine regulation. Disruption of this pathway may affect the availability of active folate, which is essential for reproductive processes. This study aimed to analyse the distribution and clinical implications of MTHFR C677T and A1298C polymorphisms, both individually and as haplotypes, in relation to pregnancy failure following IVF among infertile women. This study employed an observational analytical case-control design. The study population consisted of infertile women undergoing IVF, who were classified into a pregnancy failure group and a clinical pregnancy group. Biological samples were obtained using buccal swab or buccal gargle methods, followed by DNA extraction using the GENxTRACT method. MTHFR gene polymorphisms were analysed using multiplex-based quantitative Polymerase Chain Reaction (qPCR). The results demonstrated no significant differences in the individual genotype distributions of MTHFR C677T and A1298C between the two groups ($p > 0.05$). However, haplotype analysis of the combined variants showed a statistically significant association with pregnancy failure following IVF ($p < 0.05$). These findings highlight the importance of haplotype-based approaches in genetic risk interpretation and underscore their implications for folate status optimization and proportional genetic counseling in IVF programs.

Keywords: *MTHFR C677T, MTHFR A1298C, in vitro fertilization, genetic polymorphism, pregnancy failure, haplotype, genetic counseling.*